

Three Previously Undescribed Central American Species of *Sloanea* (Elaeocarpaceae)

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ABSTRACT. *Sloanea geniculata* Damon A. Smith, *S. laevigata* Damon A. Smith, and *S. rugosa* Damon A. Smith are described from Nicaragua and Costa Rica based primarily on stamen, foliage, and stipule characters. They are differentiated from the most closely related *S. faginea* Standley, *S. schomburgkii* Benthams, and *S. meianthera* Donnell Smith, respectively, and Latin diagnoses, specimen lists, and summaries of distinguishing features are provided. Illustrations are also provided for *S. geniculata* and *S. rugosa*.

Although Costa Rica has the highest collection density of any Central American country (Gentry, 1978), new species are continually being discovered there, particularly among hard to collect arborescent groups. *Sloanea* is a case in point, with eleven species new to science and eight range extensions recorded in Costa Rica in the forty years since C. E. Smith's (1954) monograph of the New World species (D. A. Smith, in prep.). Three of the new species occur along the eastern edge of the Caribbean piedmont. Although they are at present known only from small areas in Costa Rica and Nicaragua, the true range of each may well be larger. They are presented here to accommodate publication of the *Flora of Nicaragua*. The information presented here is in large part a product of research conducted at Duke University, Durham, North Carolina (D. A. Smith, 1985).

In the following descriptions, "growth increment" indicates that portion of a twig produced during a flush of growth.

- 1. *Sloanea geniculata*** Damon A. Smith, sp. nov.
TYPE: Costa Rica. Heredia: Finca La Selva, on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, about 100 m elev., banks of the Quebrada El Salto along the South Boundary Trail, 10 May 1984 (fl, fr), Wilbur & Jacobs 34183 (holotype, DUKE; isotypes, CR, F, MO, US). Figure 1.

Arbor parva vel mediocris. Rami 4–7 mm crassi, dense tomentosi; stipulae (1.2–)2.0–4.0(–6.3) cm longae, (0.4–)0.6–1.0(–1.4) cm latae, lanceolatae, adaxialiter valde con-

cavae, persistentes. Folia alterna; laminae (7.0–)19.0–33.0(–48.2) cm longae, (4.1–)7.0–15.0(–19.0) cm latae, plerumque serratae, in apice acuminatae. Inflorescentia (2–)4–16-floribus, axe plerumque 2–7 cm longo; bracteis (0.2–)0.4–1.0 cm longis, 2–8 mm latis, valde concavis, plerumque tridentatis. Flores rosei, antheris luteolis; sepala (3.0–)4.0–6.0(–8.25) mm longa, 1.0–3.0(–4.5) mm lata; stamina (3.3–)4.4–7.4 mm longa, antheris (0.8–)1.0–1.6(–2.2) mm longis ad basim dehiscentibus, aristis (0.9–)1.1–2.1 mm longis, subulatis, plerumque bigeniculatis. Capsulae 2.0–2.5 cm longae, 1.3–2.0 cm latae, ellipsoidae vel cylindricae, spinis heteromorphis usque 5–11 mm longis.

Tree to 25 m tall, to 60 cm DBH; buttresses small, trunk usually fluted; bark reddish, with prominent lenticels. Twigs 4–7 mm diam., densely tomentose to long-tomentose; apical buds conical, with stipules and leaves tightly adpressed, loosely enclosed by stipules from upper nodes. Leaves alternate; stipules persistent on youngest 1–3 growth increments, (1.2–)2.0–4.0(–6.3) cm long, (0.4–)0.6–1.0(–1.4) cm wide, lanceolate, canoe-shaped, entire, tip attenuate, base asymmetric and truncate to slightly cordate; midrib ridged, margins with obscure net venation; midrib abaxially densely strigose, lamina sparsely so; petiole (1.0–)3.0–7.5(–10.6) cm long, (1.0–)1.5–3.0 mm diam., usually densely tomentose, occasionally also strigose, tomentum more pronounced adaxially; upper pulvinus prominent on mature leaves, lower rarely so; lamina (7.0–)19.0–33.0(–48.2) cm long, (4.1–)7.0–15.0(–19.0) cm wide, with 17–25 secondary vein-pairs, mostly obovate to narrowly oblanceolate, occasionally elliptic; tip narrowly acuminate, blunt; base rounded to truncate or slightly cordate, rarely acute-cuneate; margin apically crenate to blunt-serrate about 1/2 to 1/3 of length; primary vein densely tomentose and secondary veins sparsely short-tomentose to puberulent adaxially; primary vein tomentose to long-tomentose abaxially, occasionally densely so, all other veins short-tomentose to puberulent, indument reduced on smaller veins or occasionally lacking on veins of tertiary and higher order; primary to occasionally tertiary veins depressed adaxially, all others flush or slightly raised; all veins raised abaxially; venation eucampitodromous basally, usually becoming semicraspedodromous, or less often craspedodromous or

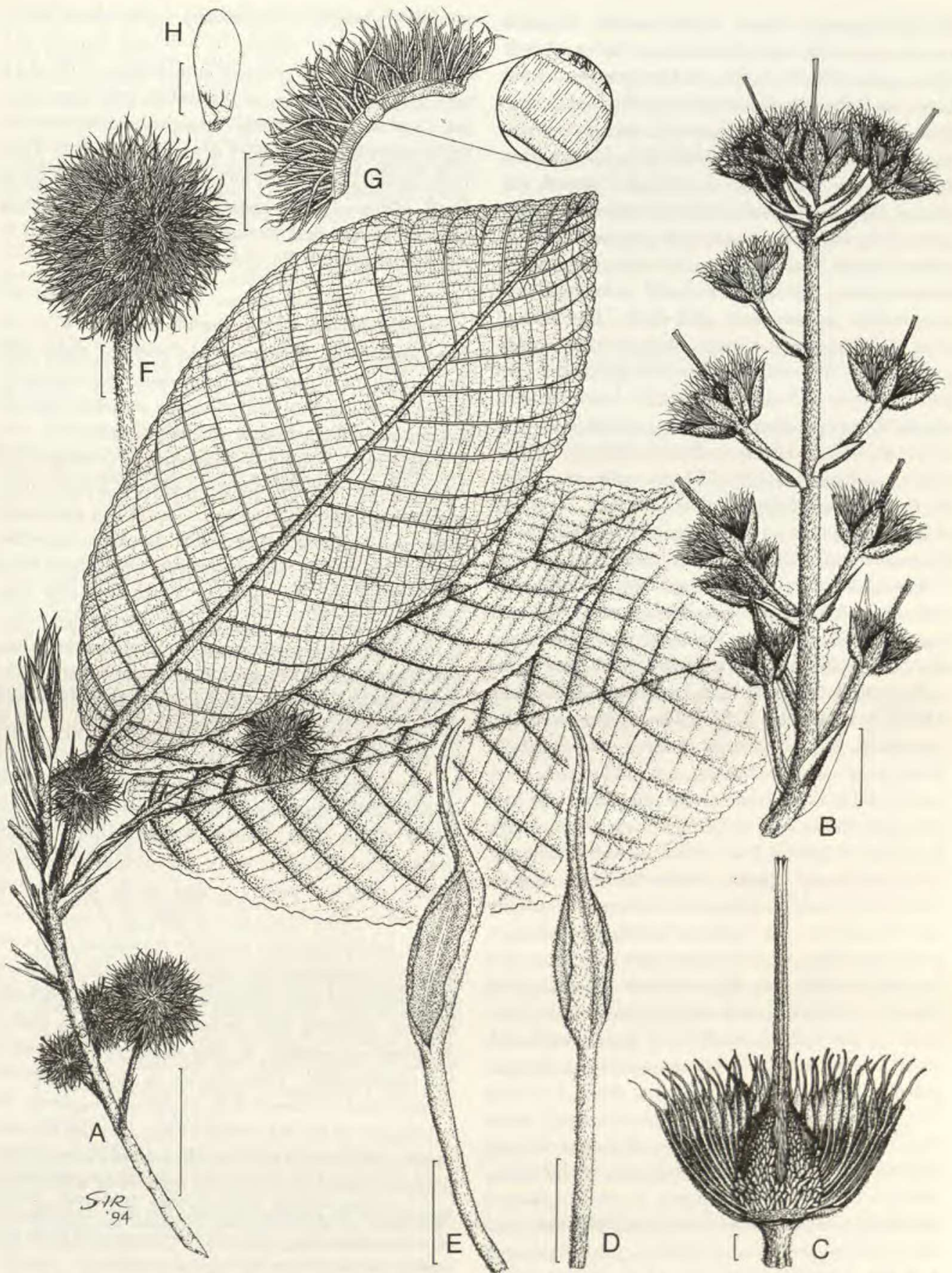


Figure 1. *Sloanea geniculata* Damon A. Smith. —A. Branch with fruits. —B. Inflorescence. —C. Old flower with capsular spines starting to develop. —D. Stamen from old flower, dorsal view. —E. Stamen from old flower, lateral view. —F. Unopened capsule. —G. Capsular valve with detail of wall layers apparent at the suture. —H. Seed with aril, chalazal end up. (A–E from the holotype sheet of Wilbur & Jacobs 34183; F–H from D. Smith et al. 1216. Scale bars represent 5 cm for A, 1 cm for B, F, G, and H, and 1 mm for C, D, and E.)

brochidodromous, above widest point; tertiaries straight or rarely forked; intersecondaries absent. *Inflorescences* (2-)4-16-flowered racemes or thyrses borne on leafy or leafless nodes on the youngest to third youngest growth increment, densely tomentose; bracts and bracteoles (0.2-)0.4-1.0 cm long, 2-8 mm wide, lanceolate to strongly cupped, enclosing very young buds, entire to apically tridentate, rarely three bracts at a node shaped like miniature leaves and stipules, densely strigose to short-strigose, indument reduced adaxially and marginally; primary axis (0.3-)2.0-7.0(-9.0) cm long, 2-3 mm diam. basally, tapered to the apex; pedicels 0.2-2.6(-4.0) cm long, 0.8-2.0 mm diam., flared apically and usually tapered to base. *Flowers*: sepals light green abaxially, yellow or reddish adaxially, (6-)7-12(-14) per flower, (3.0-)4.0-6.0(-8.25) mm long, 1.0-3.0(-4.5) mm wide, triangular to ovate, strap-shaped on old flowers, sparsely short-tomentose or strigose abaxially, densely short-tomentose adaxially; stamens ca. 40-120, yellow or yellow with orange awns, outer occasionally reddish, (3.3-)4.4-7.4 mm long; filaments 1.4-3.3 mm long, 0.2-0.3 mm diam., widening gradually to anther, often flattened dorsiventrally, short-tomentose; anthers (0.8-)1.0-1.6(-2.2) mm long, (0.3-)0.4-0.6(-0.7) mm wide, 0.32-0.44(-0.52) mm thick, lanceolate, with 2 abaxial ridges, connective \pm flush, mostly short-tomentose but anther-sacs often nearly glabrous and connective often abaxially puberulent, anther-sacs opening widely along entire length; awns (0.9-)1.1-2.1 mm long, 0.15-0.30 mm diam., uniformly tapered, mostly flattened, angled, or grooved, basally sparsely tomentose and usually apically glabrous, at anthesis mostly bent sharply at the base away from the floral axis with some also recurved at the very tip, awns on older stamens often less sharply bent or merely gently curved; pistil 5-11 mm long (probably 5-7 mm at anthesis), densely tomentose to strigose except for stigmas, pubescence decreasing apically; ovary 1-3 mm long, 1.6-2.75 mm diam., ovoid, generally wider than long; style 3.7-7.3 mm long, the upper $\frac{1}{2}$ to $\frac{1}{6}$ or less 3-5(-6)-parted, often irregularly so. *Infructescences* 1-2-fruited, on youngest to third youngest growth increment; peduncles 0.0-9.2 cm long, 2-3 mm diam., tapered to apex; pedicels 1.2-3.0 cm long, 1-2 mm diam. *Capsules* red at maturity, red within, 2.0-2.5 cm long, 1.3-2.0 cm diam., elliptical to \pm cylindrical; valves 4-5 per fruit, 2-3 mm thick, opening to about 90°, flat to slightly reflexed, outer wall layer barely evident at base; spines dimorphic, densely covering capsule, longer spines to 5-11 mm long, 0.27-0.9 mm diam. at the base, flaring or straight at the base, tapered to a sharp point, short-strigose,

usually hooked, occasionally with short basal branches; shorter spines to 3-5 mm long, 0.04-0.08 mm diam. at point of attachment, 0.08-0.15 mm diam. just above, to 0.15-0.25 mm diam. distally, cylindrical or clavate, straight, constricted basally, short-strigose, easily detached; seeds 1-4 per fruit, about 1.3-1.6 cm long and 0.9 cm wide when fresh, ellipsoid and somewhat flattened, completely covered by the fleshy orange aril which is fused to the chalazal $\frac{1}{3}$ of the seed.

Habitat and phenology. Stream banks and recent alluvial soils on the Caribbean slope of northern Costa Rica, from near sea level to about 200 m elevation; flowering April-May (occasionally June), fruiting mostly July-August (one fruiting collection each from March and September).

Discussion. *Sloanea geniculata* is distinguished by its medium-sized elongate serrate leaves, relatively large adaxially concave lanceolate persistent stipules, dimorphic densely packed capsular spines, and long staminal awns which are often bent sharply at the base and frequently also near the apex. The floral and capsular morphology place it in C. E. Smith's subgenus *Sloanea*, section *Sloanea*. Specimens of *S. geniculata* have been consistently misidentified as *S. faginea* Standley, which has much smaller wing-shaped stipules that never persist beyond the youngest growth increment, smaller leaves broader in proportion to their length, somewhat smaller ovoid fruits, short straight staminal awns, and essentially flat inflorescence bracts. The foliage of some specimens of *S. geniculata* closely resembles that of *S. tuerckheimii* Donnell Smith, which can always be distinguished by the relatively small narrowly triangular caducous stipules, monomorphic slender capsular spines, or short staminal awn. *Sloanea geniculata* is part of a species complex that includes *S. faginea* and *S. guapilensis* Standley, as well as several species as yet undescribed. This species is locally common around and to about 200 m elevation above the confluence of the Río Puerto Viejo and the Río Sarapiquí, and has so far been found only at one other location about 45 km to the east. It is well known in spite of its limited distribution due in large part to a long-standing collecting program and flora project at the La Selva biological station.

The specific epithet was chosen to describe the kneelike bend in the staminal awn.

Paratypes. COSTA RICA. **Heredia:** Parque Nacional Braulio Carrillo, estación Magsasay, Sarapiquí, 10° 24' 10" N, 84° 03' 30" W, elev. 150 m, 5 July 1990 (fr), *Aguilar 142* (INB); near Puerto Viejo, elev. under 100 m, 20 Sep. [probably 1965] (fr), *Hern 7* (US); bank of the Río Puerto Viejo, about 4-6 km SE of Puerto Viejo, 30 Aug.

1984 (fr), *D. Smith et al.* 1216 (CR, DUKE, F, MO); Finca La Selva, on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, about 100 m elev., along Camino Central, southern half, cpDNA voucher, 23 Sep. 1988 (veg), *Alverson* 2178 (WIS); on small trail exiting behind "old new lab" built around 1983, cpDNA voucher, 12 May 1990 (veg), *Alverson* 2211 (WIS); en el Arboretum, 18 May 1983 (fl), *Chacón* 801 (CAS, DUKE, F, GH, MICH, NY); cacao overstory, primary forest, 25 June 1969 (fl, fr), *Frankie* 192a (MO); along trail from Pejebaje to Arboretum, near junction with El Surá trail, 27 May 1978 (fl), *Grayum* 1339 (DUKE, LL, MO, NY, US); along trail from Pejebaje grove to Arboretum, 6 Apr. 1980 (imm. fl), *Hammel* 8473 (DUKE, GH, NY, US); at south boundary along Q. El Salto, 7 Apr. 1982 (fl), *Hammel* 11604 (CR, DUKE, MICH, MO, TX); on ridge in Plot 3, 4 May 1982 (fl), *Hammel* 12014 (DUKE, F); in forest on ridge in SW quarter of new property, 7 June 1982 (imm. fr), *Hammel & Trainer* 12912 (DUKE, F); Plot 1, tag 0890, 7 Mar. 1970 (fr), *Hartshorn* 829 (MO); trail to Area 1, between river road and Río Puerto Viejo, 13 Apr. 1973 (fl), *Hartshorn* 1148 (DUKE, MO); Holdridge Arboretum tag #35, 31 Aug. 1973 (fr), *Hartshorn* 1290 (F); Lindero Sur at Quebrada Salto, 15 June 1984 (old fl), *Jacobs* 2348 (DUKE); El Salto at the south boundary, 16 May 1985 (old fl), *Jacobs* 3052 (DUKE); West River Road, 23 May 1985 (old fl), *Jacobs* 3132 (CR, DUKE, MO, WIS); Lindero el Peje, 25 May 1985 (fl), *Jacobs* 3134 (CR, DUKE, F, MO, US); Holdridge trail, at a small stream crossing, 26 May 1985 (old fl), *Jacobs* 3159 (CAS, CR, DUKE, F, LL, MO, NY, US); "no-name" trail from the Pejebaje grove to the arboretum, 2 Sep. 1984 (veg), *D. Smith* 1220 (DUKE, NY); by Q. Salto at South Boundary trail, 27 July 1979 (imm. fr), *Sperry* 1084 (CAS, DUKE, MO); in the vicinity of the arboretum along Q. Arboreta, 22 May 1985 (imm. fr), *Wilbur* 37250 (CR, DUKE). **Limón:** Pueblo Nuevo, 17 km NE of Cariari, on the farm of Bernardo Herrera M., 10°20'N, 83°36'W, 100 m elev., 9 Sep. 1994 (veg), *Thomsen* 1143 (CR, K, USJ, WIS).

2. *Sloanea laevigata* Damon A. Smith, sp. nov.

TYPE: Costa Rica. Heredia: Finca La Selva, the OTS field station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, about 100 m elev., far research loop trail, 360 m from its beginning on the West River Road, trail tree #260, 10 Apr. 1982 (old fl), *Hammel* 11654 (holotype, DUKE; isotypes, CAS, CR, F, GH, MO, NY, US).

Arbor ad 35 m alta. Rami (3-)4-8 mm crassi, strigosi vel glabrati; stipulae 4-6 mm longae, 2-4 mm latae, triangularae, plerumque caducae. Folia alterna; laminae (9.3-)15-26(-39.6) cm longae, (3.9-)7-13(-15.5) cm latae, integrae, in apice acutae vel breve acuminatae. Inflorescentia 3-5-floribus, axe 1-3 cm longo. Flores viridibus, antheris luteolis; sepala 1.0-1.6 cm longa, 4-7 mm lata, stamina 7-9 mm longa, antheris (2.2-)2.6-6.4 mm longis ex apice 1/5-1/3 dehiscentibus, aristis 1.0-2.4 mm longis, teretibus, rectis vel ad basim abaxialiter flexis. Capsulae 3.1-3.8 cm longae, 1.9-2.6 cm latae, inermis.

Tree to 35 m tall, to 1.5 m diam. above the buttresses; buttresses to 3 m tall and 4 m wide or larger, about 10 cm thick; bark smooth, light gray.

Twigs (3-)4-8 mm diam., narrowing only slightly at the apex, terete; strigose to sparsely strigose, rapidly becoming glabrous, hairs tightly appressed; apical buds mostly short-conical, with leaves and stipules tightly adpressed. Leaves alternate, present only on youngest growth increment, often decreasing in size toward apex; stipules \pm caducous (see discussion below), 4-6 mm long in bud, mostly about 6 mm long at maturity, 2-4 mm wide; triangular to narrowly triangular with thickened midrib and thickened, often calluslike base, outer half of lamina often wider than inner; entire; long to short strigose, particularly on midrib; petiole (1.4-)3-7(-10.8) cm long, (1.0-)2.0-2.5 mm diam.; \pm terete, often with an adaxial ridge and three grooves descending from upper pulvinus; glabrous to basally tightly appressed-strigose; both pulvini prominent and darker than rest of petiole, upper often greatly enlarged; lamina (9.3-)15-26(-39.6) cm long, (3.9-)7-13(-15.5) cm wide, with 9-13 secondary vein-pairs, elliptic to obovate or oblanceolate; tip acute to broadly short-acuminate; base cuneate to concave, acute to obtuse; margin entire to broadly shallowly crenate; glabrous; primary and secondary veins raised and others slightly raised on both surfaces, veins usually lighter than rest of lamina; venation eucamptodromous basally, mostly brochidodromous above widest point, loop-forming branches often irregular; tertiaries straight or forked; intersecondaries mostly absent, occasionally present as irregular or indistinct composite segments. Inflorescences 3-5-flowered simple to once-compound dichasia on most recent growth increment, sparsely to densely short twisted-tomentose; bracts and bracteoles not seen, but simple bract and bracteole scars present; primary axis 1-3 cm long, 2.5-3.0 mm diam., secondary peduncles 1.0-1.3 cm long, about 2.0 mm diam., pedicels 1.5-2.6 cm long, 1.5-2.5 mm diam. basally, tapering to base. Flowers: sepals light green, 4 per flower, 1.0-1.6 cm long, 4-7 mm wide, \pm triangular, acute, fleshy, deciduous, reflexed at anthesis, strigose to densely long-strigose adaxially, densely minutely lanate abaxially; receptacle much broader than pedicel apex at sepal attachment; stamens approx. 200-300, yellowish, 7-9 mm long; filaments 0-6 mm long, about 0.1 mm diam., shortest at center of flower, terete, abruptly joined to anther, densely short twisted-tomentose; anthers (2.2-)2.6-6.4 mm long, 0.5-0.7 mm wide, about 0.4 mm thick, reduced toward periphery of flower, \pm straight, linear-lanceolate becoming oblanceolate with dehiscence, abruptly joined to filament, connective depressed on both surfaces, nearly glabrous to sparsely short-tomentose, anther-sacs opening by

terminal pores about $\frac{1}{5}$ – $\frac{1}{3}$ of length; awns 1.0–2.4 mm long, 0.1–0.2 mm diam., longest toward periphery of flower, straight or bent away from floral axis, terete except for adaxial groove, glabrous; pistils 1.0–1.3 cm long, densely minutely twisted tomentose to base of style; ovary 5–7 mm long, about 4 mm diam., roughly cylindrical to ovoid; style 5–6 mm long, 3–4-parted near the apex. *Infructescences* 1 (probably to 3)-fruited, on youngest growth increment, peduncles about 1.7 cm long, about 2 mm diam., pedicels on fallen fruits 1.2–2.3 cm long, 3–5 mm diam., about twice as thick apically as basally. *Capsules* dark brown overall (fide Herrera), unarmed, ellipsoid, 3.1–3.8 cm long (estimated from open capsules), 1.9–2.6 cm diam., with an enlarged angular receptacle at the base; valves 3–5, 4–6 mm thick, recurved or flat when dry, outer layer thicker than inner nearly to apex; seed solitary, about 1.8 cm long, about 1.2 cm diam., nearly globose, exposed seed coat black (fide Herrera); aril aromatic, white (fide Herrera), partly covering seed.

Habitat and phenology. Wet evergreen forests from around sea level to 700 m elevation on the Caribbean slope of Costa Rica; flowering collections from April and June, fruiting June–November.

Discussion. *Sloanea laevigata* is distinguished by the medium-sized nearly glabrous leaves, caducous stipules, large flowers with abaxially wooly, green, fleshy sepals, stamens with elongate anthers that are longer toward the center of the flower and that open by a relatively small apical pore, terete filaments that are shorter toward the center of the flower, long filiform staminal awns, and unarmed capsules with valves recurved to flat when dry. The floral morphology and inflorescence form place it in C. E. Smith's subgenus *Quadrisepala*, section *Paniculi*. Though the stipules are usually caducous, they may occasionally persist at several upper nodes on mature shoots and at the leafy nodes of juvenile shoots. Those on juvenile shoots are often asymmetric and tightly appressed to the stems. The variation in stamen morphology within the flowers, though distinctive in Central America, is shared by the South American species *S. durissima* Spruce ex Benth, *S. nitida* G. Don, *S. schomburgkii* Benth, and *S. synandra* Spruce ex Benth. *Sloanea laevigata* is most similar to *S. schomburgkii*, which may be distinguished by the somewhat longer inflorescences (peduncles 1.8–7.0 cm long), obtuse pink or pale cream sepals, and possibly by the shorter staminal awns and thinner capsule walls. *Sloanea laevigata* has long been known as *S. latifolia* (Richard) K. Schumann, but bears only superficial resemblance to that species. *Sloanea la-*

tifolia differs in having more slender twigs, smaller flowers, and a short staminal awn (about 0.2–0.4 mm long, based on illustrations in Castaneda (1981), and Martius (1886, tab. 35, fig. 1)). It is known only from Amazonia, and is poorly represented in U.S. herbaria.

The majority of the specimens of *S. laevigata* have come from the OTS field station "La Selva," where it occurs mainly on old alluvial soils and is sparsely distributed. The specific epithet was chosen to describe the glabrous leaves without prominent secondary and higher order veins.

Paratypes. COSTA RICA. **Alajuela:** near Florencia, 20 Nov. 1965 (fr), *Hern 51* (CR, US); Upala, Bijagua, El Pilón, camino a Río Chimurria, 10°43'30"N, 84°59'W, elev. 600 m, 21 July 1988 (fr), *Herrera 2140* (F, MO); cantón Upala, finca Los Tigres, en las Flores de Bijagua, 600–650 m elev., Dec. 1992 (veg), *I. Salas s.n.* (USJ). **Heredia:** Parque Nac. Braulio Carrillo, estación Magsasay, Sarapiquí, 10°24'10"N, 84°03'30"W, 200 m elev., 17 Sep. 1990 (fr), *Aguilar 75* (INB); Finca La Selva, the OTS field station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, about 100 m elev., far loop trail, June 1982 (fr), *Fetcher s.n.* (DUKE); 1984 (fr), *Fetcher s.n.* (DUKE); 14 July 1973 (veg), *Poveda et al. s.n.* (USJ); on the Near Research Loop, about 10 m S of the trail on the slope of a small rise, 26 June 1984 (old fl), *D. A. Smith & Jacobs 1225* (CR, DUKE, F, NY, US). **Limón:** Cantón de Limón, El Progreso, entre Cerro Muchilla y Cerro Avioneta, siguiendo las filas que llevan a las cabeceras del Río Suruy, fila Matama, Valle de la Estrella, 9°47'18"N, 83°8'45"W, elev. 675 m, 18 Apr. 1989 (fr), *Herrera & Chacon 2650* (USJ, WIS).

3. *Sloanea rugosa* Damon A. Smith, sp. nov.
TYPE: Costa Rica. Heredia: along Río Puerto Viejo, about 3–5 km SE of Puerto Viejo de Sarapiquí on the road to Río Frío, 30 Aug. 1984 (fr), *D. Smith et al. 1215* (holotype, DUKE; isotypes, CR, F, MO, US). Figure 2.

Arbor parva vel mediocris. Rami plerumque 1.5–3.0 mm crassi, dense tomentosi; stipulae (0.6–)1.0–2.7 mm longae, 0.15–0.60 mm latae, lineares, caducae. Folia opposita; laminae (2.1–)5.0–17.0(–22.0) cm longae, (1.3–)2.0–8.0(–11.5) cm latae, subtus plerumque dense tomentosae, repandae vel raro integrae. Inflorescentiae parvae, in ramulos veteres portatae. Flores parvi, luteoli; sepala (1.0–)1.5–3.6 mm longa, (0.4–)1.0–1.5(–3.0) mm lata, stamina (1.9–)2.5–4.0(–4.2) mm longa, filamentis tomentosis teretibus (1.0–)1.5–3.1 mm longis, antheris (0.6–)0.8–1.1 mm longis ad basim dehiscentibus aristis obtusis plerumque 0.10–0.25 mm longis. Capsulae (1.1–)1.5–2.0(–2.5) cm longae, (0.7–)0.8–1.2 cm latae, ellipticae, valvis (1.3–)2.0–3.0 mm crassis; spinis monomorphis, linearis, usque 5–9 mm longis.

Tree to 20 m tall, to 80 cm DBH, buttresses small, narrow; bark reddish, with prominent lenticels. *Twigs* (1.2–)1.5–3.0(–4.0) mm diam., densely tomentose to short-tomentose; apical buds mostly



Figure 2. *Sloanea rugosa* Damon A. Smith. —A. Branch with fruits. —B. Inflorescence. —C. Flower; composite of old flower and detached stamens. —D. Stamen, dorsal view. —E. Stamen, lateral view, before dehiscence. —F. Capsule (split in drying, but valves not separated). —G. Capsular valve with detail of wall layers apparent at the suture. —H. Seed, aril missing, chalazal end down. (A, F, G, and H from holotype sheet of *D. Smith et al.* 1215; B–E from *Jacobs & Grayum* 3227. Scale bars represent 5 cm for A, 1 cm for B, F, G, and H, and 1 mm for C, D, and E.)

conic to lanceolate, densely strigose. Leaves opposite to occasionally subopposite, persisting on youngest 1–2 growth increments; *stipules* caducous, (0.6–)1.0–2.7 mm long, 0.15–0.6 mm wide, linear, entire, densely strigose; *petiole* (0.2–)0.5–2.5(–3.6) cm long, (0.6–)0.8–1.4(–2.0) mm diam., flat to canaliculate adaxially toward apex, densely tomentose to short-tomentose; upper pulvinus prominent, lower inconspicuous except on fresh material; *lamina* (2.1–)5.0–17.0(–22.0) cm long, (1.3–)2.0–8.0(–11.5) cm wide, with (5–)6–9(–11) secondary vein-pairs, elliptic or lanceolate to obovate or oblanceolate; apex acute to acuminate; base usually cuneate-acute, often narrowly truncate, occasionally rounded or slightly cordate; margin entire to shallowly crenate, rarely shallowly blunt-serrate apically; primary to secondary or tertiary veins depressed and tomentose to densely tomentose adaxially, all veins raised and densely to sparsely tomentose abaxially, with primary and secondary to tertiary veins prominent; venation eucamptodromous basally, usually becoming brochidodromous at or above widest point, rarely craspedodromous apically; tertiaries mostly straight; interrupted composite intersecondaries occasionally present. *Inflorescences* (1–)3–7-flowered racemes borne mostly on second to third youngest growth increments. *Flowers*: sepals (1.0–)1.5–3.6 mm long, (0.4–)1.0–1.5(–3.0) mm wide, triangular to lanceolate or ovate, entire to lacinate, tomentose, with indument reduced adaxially; stamens yellow (fide Herrera), ca. 30–60, (1.9–)2.5–4.0(–4.2) mm long, tomentose with indument reduced on anther and awn; filaments (1.0–)1.5–3.1 mm long, (0.06–)0.10–0.15 mm diam., terete to strongly flattened, tomentose to sparsely so; anthers (0.6–)0.8–1.1 mm long, 0.15–0.30 mm wide, 0.2–0.5 mm thick, tomentose to glabrous, opening broadly the entire length; awn 0.10–0.25 mm long, 0.10–0.15 mm wide, terete to somewhat flattened, puberulent to glabrous, straight or abaxially bent, blunt; pistil about 5–7 mm long, densely strigose to the basal $\frac{1}{3}$ of style, ovary about 1.7–1.8 mm long, 1.2–1.3 mm diam., style about 3–5 mm long, with 3–4 lobes about 0.25–1.0 mm long apically (appearing entire in fruit). *Infructescences* 1–3-fruited, on leafless nodes 2–4+ growth increments from the stem-tip, densely tomentose; peduncles 2–15 mm long, 1.2–2.5 mm diam.; pedicels 2–6 mm long, 0.9–1.5 mm diam. *Capsules* green to reddish overall at maturity, (1.1–)1.5–2.0(–2.5) cm long, (0.7–)0.8–1.2 cm diam., ellipsoid; valves 3–4 per fruit, (1.3–)2.0–3.0 mm thick, spreading flat; spines monomorphic, not densely packed, 5–9 mm long, 0.1–0.5 mm diam., stiff, brittle, straight, tapered from base to somewhat clavate, briefly tapered to a sharp tip, strigose;

seeds 1.1–1.4 cm long, about 7 mm diam., 1 or rarely 2 per capsule, ellipsoid and somewhat flattened, completely covered by the fleshy orange aril firmly attached to chalazal $\frac{1}{3}$.

Habitat and phenology. Wet evergreen forest from near sea level to about 700 m elevation on the Caribbean slopes of Nicaragua and Costa Rica and on the Osa peninsula, possibly also in Panama; one flowering collection from April, range most likely April–June, fruiting June–September.

Discussion. *Sloanea rugosa* is distinguished by the small, opposite, mostly obovate or oblanceolate, abaxially tomentose leaves, densely tomentose stems, small, linear, caducous stipules, small flowers borne on short inflorescences from relatively old nodes, short anthers with awns about as long as anthers are wide, and small, relatively thick-walled capsules with short, monomorphic, linear spines which are not densely packed. The floral and capsular spine morphology place it in C. E. Smith's subgenus *Sloanea*, section *Brevispicae*. *Sloanea rugosa* is most closely related to *S. brenesii* Standley, *S. guianensis* (Aublet) Bentham, and *S. meianthera* Donnell Smith, and vegetative or juvenile material may be difficult to distinguish from the latter two species. *Sloanea meianthera* may be distinguished from *S. rugosa* by the smaller, nearly glabrous leaves and stems, shorter stipules (< 1 mm long), essentially awnless anthers, smaller and thinner-walled capsules borne on younger twigs, and shorter, densely packed capsular spines. *Sloanea brenesii* may be distinguished by the smaller, less acute leaves with much shorter petioles and with apical secondary veins that usually extend to the margin (craspedodromous), and generally smaller capsules with shorter spines. *Sloanea guianensis* differs in the nearly glabrous petioles and leaf veins, and thinner capsule walls. *Sloanea rugosa* is represented in herbaria by scattered collections from the Caribbean piedmont of Costa Rica and southeastern Nicaragua, and one collection from the Osa peninsula. Two vegetative specimens from the Panama Canal Zone (*Gentry* 3227 (MO) and 3283 (MO)) may also belong to this species. It appears to have roughly the same range in Costa Rica as *S. guianensis*; *S. brenesii* and *S. meianthera* occur at higher elevations (ca. 800–1600 m and ca. 300–1100 m, respectively).

Material showing flowers with stamens (*Moraga* 350) was not seen until after the illustrations had been prepared, but agrees well with Figure 2 (B, C), which was extrapolated from detached stamens and very young fruits.

The specific epithet describes the typical leaf texture.

Paratypes. COSTA RICA. **Alajuela:** Upala, Colonia Libertad, 2 km al noreste de la escuela, 300–400 m elev., 2 May 1988 (imm. fr), *Herrera 1932* (MO); Upala, Bijagua, El Pilón, alrededores de la intersección del camino de Argüello con Río Chimurria margen izquierda, 10°43'30"N, 85°00'30"W, 600–700 m elev., 19 July 1988 (fr), *Herrera 2128* (MO); San Carlos, rumbo a La Marina, 23 Aug. 1973 (imm. fr), *Poveda 592* (CR); San Carlos, San Joaquín de Cutris, 12 Aug. 1983 (veg), *Poveda et al. 3629* (CR); San Carlos, San Joaquín de Cutris, 12 Aug. 1983 (fr), *Poveda et al. 3639* (CR); San Carlos, San Luis de Cutris, finca de Oldenar Perozo, 20 July 1985 (fr), *Zamora & Poveda 1023* (MO). **Heredia:** Parque Nacional Braulio Carrillo, estación Magsasay, Sarapiquí, 10°24'18"N, 84°03'30"W, elev. 200 m, 5 July 1990 (imm. fr), *Acevedo et al. 142* (CR); Parque Nacional Braulio Carrillo, estación Magsasay, 10°24'04"N, 85°03'03"W, elev. 200 m, 5 July 1990 (imm. fr), *Carballo 159* (CR); along Río Puerto Viejo, ca. 3 km N of Las Horquetas on road to Puerto Viejo de Sarapiquí, elev. ca. 60 m, 10°23'N, 83°58'W, 19 July 1984 (imm. fr), *Grayum et al. 3569* (DUKE, MO); road between Puerto Viejo and Horquetas, along the Río Puerto Viejo, 2 June 1985 (imm. fr), *Jacobs & Grayum 3227* (DUKE). **Guanacaste:** Estación Pitilla, La Cruz, Parque Nacional Guanacaste, 10°59'26"N, 85°25'40"W, elev. 700–1000 m, 1 Apr. 1991 (old fl), *Moraga 350* (MO). **Puntarenas:** Osa peninsula, Reserva Forestal Golfo Dulce, Rancho Quemado, ca. 15 km W of Rincón, along Quebrada Quebradón and ridge above it, 8°40'N, 83°34'W, elev. 200 m, 4 June 1988 (imm. fr), *Hammel et al. 17023* (MO). NICARAGUA. **Zelaya:** Río Barbarena a 5 km de Nueva Guinea, 11°47'N, 84°29'30"W, elev. 160 m, 27 Aug. 1982 (fr), *Araquistain 3154* (MO); municipio de Nueva Guinea, Río El Zapote, elev. 250 m, 3 Sep. 1982 (fr), *Laguna 58* (MO).

Acknowledgments. I am deeply indebted to the Graduate School, the Department of Botany, and my master's committee and major professor (R. L. Wilbur) at Duke University for their support and encouragement, as well as to the Organization for Tropical Studies and the Noyes Foundation for a post-course (Tropical Ecology, summer 1984) award, which allowed me to collect several undescribed species, including the type material of *S. rugosa*. Thanks are also due the curators of CAS, F, GH, LL, MICH, MO, NY, TX, US, and WIS for loaning specimens, and of CAS, CR, F, INB, MO, US, and USJ for their courtesy and helpfulness during my visits. Among the many other people who deserve recognition here, Michael Grayum directed me to the type tree of *S. rugosa*, Susan Reznicek prepared both of the figures, Jessica Chamberlain redrew Figure 2G, and my parents provided essential support for the preparation of this article.

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